



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/741,538	12/19/2003	David A. Petersen	2003P14535US	4649
7590	06/16/2011		EXAMINER	
Siemens Corporation Intellectual Property Department 170 Wood Avenue South Iselin, NJ 08830			CHENG, JACQUELINE	
			ART UNIT	PAPER NUMBER
			3777	
			MAIL DATE	DELIVERY MODE
			06/16/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/741,538	Applicant(s) PETERSEN ET AL.
	Examiner JACQUELINE CHENG	Art Unit 3777

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 06 December 2010.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-6,9-12 and 14-24 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-6,9-12 and 14-24 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
 2) Notice of Draftsperson's Patent Drawing Review (PTO-442)
 3) Information Disclosure Statement(s) (PTO/SB/08)
 Paper No(s)/Mail Date 2/1/11

4) Interview Summary (PTO-413)
 Paper No(s)/Mail Date _____

5) Notice of Informal Patent Application
 6) Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 6, 2010 has been entered.

Response to Arguments

2. Applicant's arguments filed December 6, 2010, with respect to the rejection(s) of the claim(s) under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, new ground(s) of rejections have been made.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 5, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marian (US 2004/0002657 A1) in view of Jago (US 2003/0171674).

5. **Claims 1, 22, 23:** Marian discloses a method and apparatus for ultrasound imaging comprising processing signals from a plurality, M, of elements within a transducer assembly 15 (fig. 4) having a transducer connector 56 (fig. 4) releasably connectable (disengaged, paragraph 0013) with an ultrasound system 10 (fig. 4), the ultrasound system comprising transmit and receive beamformers 90 (fig. 4) and a system connector 55 (fig. 4) in a system housing, the system housing comprising a cart-based housing resting on wheels 10 (fig. 1), the system connector permanently connected through a transmit and receive switch to the transmit and receive beamformers. The processed signals in the transducer assembly are converted to a different form appropriate for the ultrasound system within a connector housing 50 (fig. 4) of the transducer assembly 15 which is releasable from the ultrasound system, the converting making signals from the elements in the connector housing compatible with the receive beamformer (paragraph 0017, 0032). The system further comprises an external cable 40 (fig. 4) which connects a transducer probe housing shaped for handheld use 20 (fig. 4) and including the ultrasound transducer 30 (fig. 4) with the connector housing 50, the connector housing at least partially enclosing the transducer connector 56 and a signal processing device 215 (fig. 3), the transducer connector releasably connectable with the system connector 55 and transmitting the signals from the elements to the connector housing. Marian discloses the claimed invention except for processing signals from the plurality M elements of a multi-dimensional array of the elements to a lesser plurality N of processed signals. In the same field of endeavor Jago discloses processing signals from a plurality M elements of a multi-dimensional array of the elements to a less plurality N of processed signals by using a signal combiner 52 (fig. 2) in the form of a multiplexor (paragraph 0022). It would have been obvious to one skilled in the art at the time the

invention was made to perform multiplexing as taught by Jago in the transducer probe housing of Marian for the purpose of minimizing the number of wires reducing the thickness of the cable connecting the transducer probe housing to the connector housing. The exact number of cables in the cable 46 (fig. 2 of Jago) depends upon the amount of transducer elements and the amount of coupling of the transducer elements that is done. For example if the cables can couple signals from 10 transducer elements then it would be obvious that a scan head having 640 transducer elements would require at least 64 cables (paragraph 0023 of Jago).

6. **Claim 5:** Marian does not explicitly disclose converting digital signals to analog signals within the transducer assembly however Marian does discloses that the connector 50 uses digital signals while the ultrasound imaging system 10 receives analog signals (paragraph 0025, 0032). It would therefore be obvious that for the ultrasound imaging system to receive analog signals the digital signals in the connector must first be converted into analog signals within the transducer assembly for the purpose of the ultrasound imaging system to be able to read the information.

7. **Claims 2, 4, 9-11, 14-16, 18-21 and 24** are rejected under 35 U.S.C. 103(a) as being unpatentable over Marian in view of Jago, as applied to claim 1 above, further in view of Newman (US 6,544,175 B1). Marian discloses the claimed invention except for performing partially beamforming demultiplexed signals for each of a plurality of sub-apertures and wherein the signal processing device which is at least partially enclosed by the connector housing comprises a partial beamformer. In the same field of endeavor of ultrasonic imaging systems Newman discloses partially beamforming signals for each of a plurality of sub-apertures within

the transducer assembly (col. 4 line 6-7). It would be obvious that these signals would be first demultiplexed before being beamformed for the purpose of the multiplexed signals need to be demultiplexed before the signals can be processed further. It would have further been obvious to one having ordinary skill in the art at the time the invention was made to have the partial beamformer be either within the transducer probe housing or the connector housing of Marian since it is well known in the art to rearrange the various parts of a ultrasound system within the various housing of the ultrasound system (see for example paragraph 0022 of Hunt and throughout the specification of Hunt which discloses multiple various embodiments with the various parts of the ultrasound system being variously separated into multiple housing) and because it has been held that a rearrangement of parts of a device involves only routine skill in the art (In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950), In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)).

8. **Claims 3, 6, and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Marian in view of Jago in view of Newman, as applied to claim 2 above, further in view of Chiang (US 5,839,442). Newman discloses that to partially beamform the signals the signals are first delayed and then summed (combining the signals) but fails to disclose how exactly the signals are delayed. In the same field of endeavor of ultrasonic imaging Chiang discloses that to achieve the delay in a delay circuit of a beamformer by applying different phase shifts to signals from different elements (fig. 6, col. 2 line 56-col. 3 line 8, col. 3 line 66-col. 4 line 12) and to mix (multiplier fig. 10 element 80) the signal. It would have been obvious to one skilled in the art at the time the invention was made to use any well known delay circuit for a beamformer

such as a phase shifting delay circuit and to add a multiplier as disclosed by Chiang for the purpose of getting the correct timing depending upon the type of ultrasound being used and to generate better image quality (col. 14 line 51-55 of Chiang).

9. **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Marian in view of Jago in view of Newman as applied to claim 16 above, further in view of Leavitt (US 6,491,634 B1). Marian and Jago discloses the claimed invention except for sub-array mixing and mixing to a frequency of the beamformer channels. Leavitt discloses after partial beamforming mixing the signals with a normalization factor in multiplier 690 (fig. 6) for the purpose of bringing the frequency of the output back to the frequency of the beamformer channels (col. 10 line 2-31). Although this is describing the partial beamformer 218 in the transducer probe, Leavitt also discloses that the other part of the beamformer, the main beamformer 226 (fig. 2) which would be in the connector housing, can be implemented in a similar fashion as the partial beamformer 218 (col. 4 line 65-67).

10. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Marian in view of Jago in view of Newman as applied to claim 16 above, further in view of Hunt (US 2003/0139664). Hunt further discloses using parallel beamforming where two or more transmit or receive beams are generated simultaneously. It would be obvious to one skilled in the art at the time the invention was made to partially beamform for at least 2 simultaneously received beams as taught by Hunt in Marian for the purpose of reducing power requirements (paragraph 0058 of Hunt).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JACQUELINE CHENG whose telephone number is (571)272-5596. The examiner can normally be reached on M-F 10:00-6:30.
12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Chen can be reached on 571-272-3672. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
13. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jacqueline Cheng/
Primary Examiner, Art Unit 3777